The efficacy of single-session motivational interviewing in reducing drug consumption and perceptions of drug-related risk and harm among young people: results from a multi-site cluster randomized trial

Jim McCambridge & John Strang

National Addiction Centre (The Maudsley/Institute of Psychiatry), London, UK

Correspondence to:
Jim McCambridge
National Addiction Centre (The Maudsley/Institute of Psychiatry)
Addiction Sciences Building
4 Windsor Walk
Denmark Hill
London SE5 8AF
UK
E-mail: J.McCambridge@iop.kcl.ac.uk

Submitted 2 August 2002;
initial review completed 16 September 2002;
final version accepted 4 July 2003

ABSTRACT

Aim To test whether a single session of motivational interviewing (discussing alcohol, tobacco and illicit drug use) would lead successfully to reduction in use of these drugs or in perceptions of drug-related risk and harm among young people.

Design Cluster randomized trial, allocating 200 young people in the natural groups in which they were recruited to either motivational interviewing ($n = 105$) or non-intervention education-as-usual control condition ($n = 95$).

Setting Ten further education colleges across inner London.

Participants Two hundred young people (age range 16–20 years) currently using illegal drugs, with whom contact was established through peers trained for the project.

Intervention The intervention was adapted from the literature on motivational interviewing in the form of a 1-hour single-session face-to-face interview structured by a series of topics.

Measurements Changes in self-reported cigarette, alcohol, cannabis and other drug use and in a range of drug-specific perceptions and other indicators of risk and harm. Measurement at recruitment and follow-up interview 3 months later.

Findings A good follow-up rate (89.5%; 179 of 200) was achieved. In comparison to the control group, those randomized to motivational interviewing reduced their of use of cigarettes, alcohol and cannabis, mainly through moderation of ongoing drug use rather than cessation. Effect sizes were 0.37 (0.15–0.6), 0.34 (0.09–0.59) and 0.75 (0.45–1.0) for reductions in the use of cigarettes, alcohol and cannabis, respectively. For both alcohol and cannabis, the effect was greater among heavier users of these drugs and among heavier cigarette smokers. The reduced cannabis use effect was also greater among youth usually considered vulnerable or high-risk according to other criteria. Change was also evident in various indicators of risk and harm, but not as widely as the changes in drug consumption.

Conclusions This study provides the first substantial evidence of non-treatment benefit to be derived among young people involved in illegal drug use in receipt of motivational interviewing. The targeting of multiple drug use in a generic fashion among young people has also been supported.

KEYWORDS: alcohol, brief intervention, cannabis, cigarette smoking, drugs, motivational interviewing, young people.

INTRODUCTION

Conceptualization of the intervention problem

Drug use among young people provides numerous targets for intervention. Worrying recent trends in the prevalence of cigarette smoking, levels of drinking among young people, the emergence of new patterns of binge-drinking and rising levels of illegal drug use (Boreham & Shaw 2001; Ramsey *et al.* 2001; Walker *et al.* 2001) are all features of recent experience in Britain and elsewhere. Our capacity to influence young people's choices and behaviours with effective 'early' intervention is extremely limited, and while the application of interventions to new targets has been recommended (ACMD 1993), this challenge remains to be met.

While benefits have been associated with some primary prevention programmes elsewhere, the results of most drug interventions targeting young people are disappointing (Botvin *et al.* 1995; Foxcroft, Lister-Sharp & Lowe 1997; Tobler 1997; White & Pitts 1998). Even with effective primary prevention interventions, many young people will make decisions to initiate and to continue to use drugs. Approaches aimed at the secondary prevention of drug use among young people have hitherto received less attention.

Secondary prevention concepts and interventions targeting drug use have developed significantly since the 1980s to assist HIV prevention (ACMD 1988; Newcombe 1992). The adoption of a broader public health approach concerned with risk, rather than a clinical focus restricted to consumption or the treatment of dependence, has been extremely influential among adults (Stimson 1995; Strang 1998). Prevention needs to be re-conceptualized to explore overlooked opportunities for intervention (Strang 1994). The ACMD has recommended intervention earlier in drug-using careers to secure diversion away from high risk (ACMD 1993). For example, among the many new possibilities for intervention objectives, the prevention of progression to new higher-risk routes of administration has been identified (Hunt *et al.* 1999).

Secondary prevention of drug use among young people has been considered most widely in relation to 'vulnerable groups' such as the homeless, those involved in prostitution or children in public sector care (Updated Drug Strategy 2002). In such groups, elevated risk of serious drug problems is believed to require dedicated targeting. The basis of these targeting decisions has, however, received relatively scant attention in the research literature.

There is, however, a firm epidemiological basis to the targeting of young drug users more broadly. Adolescent drug use in the general population has long been known to involve cumulative processes (Kandel *et al.* 1986). Young people using illegal drugs are also more likely to use legal drugs (Boreham & Shaw 2001; Measham *et al.* 2001)—and more heavily (Sutherland & Willner 1998; Ramsey & Partridge 1999). Involvement in drug use at earlier ages is also associated with heightened risk of later drug problems and psychosocial difficulties more generally (Anthony & Petronis 1995; Fergusson & Horwood 2000).

Secondary prevention objectives among young people may either be *specific* to risk behaviours (e.g. reduction in current drug consumption, prevention of injecting), or *generic* (addressing the totality of a young person's relationship to drugs). Generic interventions need to take account of the life context of drug use. Targeting young people at early stages of drug-using careers with a view to reducing consumption, preventing further involvement in drug use, minimizing problems or facilitating informed choice about the personal consequences of drug use are under-developed areas of study.

Drug-related harms often only become evident a distance in time from the originating drug use events (Strang 1992; Heather 1995a). As such, a focus on possibly distant harms may be considered to lack personal relevance or salience. Specific risk behaviours, on the other hand, may be relatively amenable to intervention targeting (Strang 1993). Risk may also be conceptualized as being inherent in drug consumption or other potential source of harm (Institute of Medicine 1996). Among those considered to be at-risk, it should not be assumed that evidence of harm is absent, and assessment of both the presence and severity of specific risks and harms is necessary. In practice, measurement of risk and harm may be difficult, and surrogate indicators have been recommended as an alternative (Lenton & Single 1998). Following Kandel *et al.* (1986), short-term modification in risk may be conceptualized as having the potential to alter the course of subsequent drug use. Assessment of short-term intervention effect is the logical first step in the evaluation of intervention efficacy.

Motivational interviewing as an intervention with young people who use drugs

Encouraging evidence exists on the capacity of opportunistic brief interventions to influence smoking and drinking among adults (Russell *et al.* 1979; Heather 1995b; WHO Brief Intervention Study Group 1996; Wetter *et al.* 1998). Motivational interviewing (MI) has been developed as an influential adult intervention approach (Miller & Rollnick 1991, 2002), and adapted to other health behaviours about which the individual shows ambivalence.

MI seeks to promote reflection on drug use and its personal consequences in the context of the values and goals

of the individual. MI is not compatible with a simple and direct communication of a public policy objective, and thus occupies a potentially complex position in relation to any specific public policy objective, where there is a conflict between the values and goals of the individual and the aspirations of public policy. Such conflict may be minimized where the goals of intervention are defined broadly in terms of harm minimization and where intervention objectives are individualized.

Tober (1991) and Lawendowski (1998) consider MI to be particularly attractive to young people precisely because it is non-confrontational and does not impose specific outcomes. Minimization of resistance is central to MI. In relation to young people's drug use, it may be all too easy to try too hard to persuade—and thereby negate any potential beneficial effect by invoking resistance. Thus an intervention which helps young people to consider risk may not reduce drug consumption, but may nevertheless be influential—other possible measurable benefits involve reduction of harm or risk.

In recent years the first applications of MI with young people have been reported. In these, cigarette smoking (Colby *et al*. 1998), alcohol consumption (Monti *et al*. 1999) and cannabis use (Stephens, Roffman & Curtin 2000) have been targeted in hospital and treatment settings. The psychological mechanisms by which MI is understood to exert its effects are not drug-specific. Arguably, then, the targeting of a single drug, in populations where use of multiple drugs is common, limits unnecessarily the scope for benefit. In line with early formulations of brief applications of MI as instruments of public health intervention (Miller, Sovereign & Krege 1988), this study examined the efficacy of MI in relation to use of multiple drugs by young people.

METHOD

Study design, setting and recruitment

A cluster randomized design was used because it was likely that contamination would interfere with the intervention-control contrast. Further education (FE) colleges were identified as the setting most appropriate for the study. These are non-traditional educational and training institutions for those of postcompulsory schooling age. In Britain, three-quarters of all 16–18-year-olds continue in education (ONS 2001) and more now attend FE colleges than go to schools or are in training elsewhere. This setting permitted access to large numbers of young people in an environment conducive to recruitment, intervention and follow-up contact. Of the 17 inner London colleges contacted, only three refused to participate.

Participants were recruited by peer interviewers with 'privileged access', a procedure well established in the study of hidden populations of drug users (Griffiths *et al*. 1993). In 10 colleges (two failed to recruit, two others acted as reserves), college staff identified students who were willing to recruit their peers to the project. This was achieved either by advertisement, or introductions made to groups of students, or both. These peer interviewers (PIs) were trained in recruitment and baseline data collection procedures—checking eligibility, providing information on the project, obtaining consent and in the distribution, assistance with, and collection of brief self-completion questionnaires. Participants were not paid upon entry to the study, but were paid £10 for each interview completed.

A cluster was defined in this context as all those recruited by each individual peer interviewer, and was used as the unit of randomization. Randomization was non-computerized and consisted of a colleague (who was not involved in the study) allocating clusters randomly to either condition, with complete concealment. Stratification by college was applied in order to control for local variations in drug use. The trial compared outcomes with MI ($n = 105$) against an 'education-as-usual' control group ($n = 95$). Local ethical approval was obtained from the Institute of Psychiatry/Maudsley Hospital Ethical Committee.

Participants and data collection procedures

Young people aged 16–20 years who had current involvement with illegal drug use were sought. The inclusion criteria were weekly cannabis use or stimulant drug use within the previous 3 months; exclusion criteria were opiate and injecting drug use (deemed to be distinct subpopulation characteristics presenting different intervention challenges).

Following collation of baseline questionnaires from peer interviewers, a single attempt was made to collect missing data (which was minimal). This instrument was designed to minimize reactivity to assessment (Bien, Miller & Tonigan 1993). A structured researcher-administered interview was undertaken at follow-up.

The accuracy of self-report of drug users, including young people, participating in research studies has been investigated previously and has been found to be reliable in studies which assure participants of confidentiality and the value of the data (Oetting & Beauvais 1990; Harrison 1995; Darke 1998). Additionally, participants were required to provide prior consent to the provision of a hair sample for biochemical validation (which it was not intended to take). This was similar to the use of an 'alcohol dipstick' in the WHO cross-national brief intervention study (1996), to encourage reliable self-report of consumption data. A further area of possible bias was that intervention recipients might report more favourable

outcome data to the researcher who had delivered the intervention (J.M.). To study any such bias, a second independent interviewer who was blind to study condition, was employed to interview a sample of participants.

Intervention and control conditions

The intervention was adapted from the relevant literature, most notably the work of Miller & Rollnick (1991). Following Rollnick *et al*. (1992a), a menu of topics for discussion was developed, from which selections were made according to the course of the interview with the subject, which lasted up to 60 minutes (McCambridge & Strang, 2003). Initial discussions involved the entire range of drugs being used by the subject, after which the interviewer (J.M.) directed the focus to particular areas of risk, problems or concerns. This was negotiated according to the articulated interest of the recipient in reflection on particular aspects of risk.

With all recipients, eliciting of positives and negatives about each drug followed rapport-building. The relationship between actual and potential drug use consequences and non-drug values and goals was subsequently explored. Various counselling microskills were used, including reflective listening, affirmation, open questions and summaries, in order to elicit 'change talk' (Miller & Rollnick 2002). The objective was to create an opportunity for the participant to think and talk about risk in ways conducive to the identification of problems and concerns and to reflection on options for change—to stimulate new thinking on personal drug use, which may realize itself in behavioural change. Discussion of decisions to change a specific aspect of drug use, including the use of decisional balance exercises, took place with approximately half the 105 participants randomized to the MI study condition ($n = 55$). These involved both improving the quality of the decision to change and planning for change itself.

The control condition was 'education-as-usual'. Young people allocated to this condition completed baseline and follow-up assessments only. Beyond enquiry about sources of drug information and advice received during the three-month study period (for which both conditions were similar; data collected at follow-up), educational or other interventions targeting drug use were not studied.

Approach to outcomes study and measures used

On the basis of both the conceptualization of the intervention problem, given the nature of MI, and its particular application in this study, it cannot be predicted in advance which drugs or aspects of use will receive most attention during the course of the intervention for each individual. Because the intervention is designed specifically to prompt the participants themselves to consider options for change, it follows that any decisions to make a change, and hence the nature of any changes in drug-use or related behaviour, are chosen individually.

A range of outcomes have consequently been studied, without statistical control for the number of tests being performed. Type 1 errors are thus possible, i.e. some of the individually observed differences between the intervention group and the control group may result from chance. It was decided to reject the more conservative outcome assessment entailed by elevating the statistical thresholds for differences to be considered significant (Pocock 1997) in light of the nature of the study, and the scale of the adjustment that would be necessary. As the first investigation of its type (i.e. randomized trial of MI targeting multiple drug use for secondary prevention purposes), an early decision had been taken to adopt a more exploratory attitude to the identification of intervention benefit, a decision taken also in consideration of the possibility of Type 2 errors on unmeasured outcomes. Two implications follow from the approach taken to outcome evaluation: (1) the pattern of outcomes as a whole should be taken into account in relation to consideration of efficacy; and (2) there is a possibility that individual differences in outcome between the groups result from chance, with this possibility enhanced for those outcomes which are closer to the conventional standard of statistical significance.

The Severity of Dependence Scale (SDS) is a brief questionnaire which has been previously used for measurement of subjective cannabis, stimulant and other drug dependence (Gossop *et al*. 1995; Swift *et al*. 1998). This instrument was used for this purpose and was used additionally to assess alcohol and tobacco dependence. Consumption measures for these drugs were taken as sufficient to check for baseline equivalence between the two groups, with a baseline measure also enquiring about dependence on any illegal drug.

Interactional problems were assessed using measures developed originally for adolescent alcohol problems (Bailey & Rachal 1993). These enquired whether there were any problems with various categories of people at baseline, and additionally enquired which drugs were involved at follow-up. These questions specified problems caused by drug use. Other indicators of harm which did not require drug use attribution to be made were: health problems [as indicated by general practitioner (GP) visits] and educational harms (in the form of days absent from college). A five-point scale developed during piloting assessed educational harms attributed to drug use at follow-up. Also, at follow-up only, participants rated how problematic their use of each drug was to them.

A range of outcome measures was developed and piloted which addressed aspects of interactional risk

(drug selling, pub- and club-going, drug-related crime, intoxicated arrests, being offered and present at heroin use and present at injecting drug use). All were dichotomous except a question each on pubs and clubs, which asked about past-month frequency, and one other which asked about 3-month frequency of drug-related acquisitive crime (of which there was hardly any reported).

Two separate attempts were made to measure motivational stage of change. Both involved seeking to identify stage of change in relation to the use of any drug. They were thus not intended to identify readiness to change the use of any one particular drug. Rather, they sought to identify whether motivation to change was contemplated or acted upon for any drugs, the assumption being that the 'highest' stage of change would be reported.

Partly, this approach was taken for economy of measurement. Existing instruments which specify stage of change in relation to specific drugs were found to be too long to incorporate individually, and also to be focused on problem and behaviour change (McConnaughy *et al*. 1989; Rollnick *et al*. 1992b). The two attempts made in this study (an opportunity for self-nomination of stage of change and a series of Likert-scaled statements) were intended as simplified versions of algorithms and questionnaire scales—the two more sophisticated approaches predominant in the broader literature (Carey *et al*. 1999).

Satisfaction with drug use and other life areas was measured using the seven-point scale approach developed by Argyle (1987). Similar brief rating scales were used also for importance of drugs used and of other life areas, attitudinal positivity to drug use, views on the safety of drug use and rating of enjoyment/pleasure derived from drug use. The Drug Attitudes Scale (DAS) (Parker, Aldridge & Measham 1998), the 12-item General Health Questionnaire (GHQ) (Goldberg & Williams 1988) and dedicated questions on decisions to cut down or stop, recording behaviour and future intentions to use drugs were also administered.

Data analysis

The Huber/White sandwich estimator of variance was used to control for the clustered nature of the recruitment, using STATA (StataCorp 1998). As many of the outcomes under study were not distributed normally, this technique was additionally helpful in being robust to such data. Thus all regression coefficients were not adjusted for clustering (this was found not to be important, data not reported here), and unstandardized coefficients have been reported to enable examination of the actual size of the between-group differences.

Linear or logistic regression was used for continuous and binary outcomes, respectively. In analyses of baseline data, ethnic group was predictive of important differences in many measures. Intervention and control groups were also found to be non-equivalent in respect of this variable (see Results 1: Table 1). It was therefore decided to control for ethnic group in all outcome analyses. In addition to the baseline measure of the outcome in question and ethnic group, eight other potential confounders (see Results 2) were also investigated, by initial inclusion as covariates. These were all considered for inclusion in final models using a stepwise backward elimination procedure with a value of $P = 0.1$. These analyses have been primarily conducted among those for whom outcome data was available: the 179 participants contacted successfully after 3 months.

In addition to consideration of each outcome in this way, it was decided to investigate a small number of outcomes to test for effect modification—whether there was any subgroup variation in extent of change or benefit. Three outcomes were selected on the basis of their apparent significance. A similar approach was taken with respect to the possibility that findings would be biased by loss to follow-up. An 'intention-to-treat' analysis was undertaken in respect of the same three outcomes.

RESULTS

These results are reported in four sections, with data being presented on: (1) the participants, equivalence between experimental groups and attrition; (2) changes in drug use consumption; (3) changes in perceptions of drug-related risk and harm; and (4) aditional analyses.

Results 1: the study participants

Recruitment and participants

The 200 participants were recruited in 32 clusters by 28 peer interviewers (PIs; four of whom were employed part-time as college staff). In four cases (three intervention, one control; in three colleges) the PIs failed to recruit. In these instances, direct recruitment in informal areas (e.g. common-rooms) was undertaken by the lead author (J.M.) under the overall supervision of college-nominated link member of staff. Clusters varied considerably in size—from two to 19. Five recruits were deemed ineligible for participation for reasons of opiate use or insufficient recent drug use. The overall consent rate (to participate) could not be estimated accurately due to insufficient recording by PIs. The few reports of refusals by those eligible cited concerns about confidentiality. Randomization resulted in 105 participants in the intervention group and 95 in the control group. The intervention was delivered successfully to all 105 participants who were allocated to receive it.

Attrition and equivalence between groups

Participants were contacted initially by PIs and then by the researcher (J.M.) to arrange follow-up interviews. Of the 200 participants, 179 (89.5%) were contacted successfully and interviewed by one of two researchers after 3 months, from whom fuller background information and follow-up data were collected (Table 1).

No group differences in attrition were observed, with 97 of the 105 (92.4%) intervention recipients and 82 of the 95 (86.3%) controls retained (χ^2 1.95, 1 df, $P > 0.1$). Attrition was not entirely random: older participants (mean age 18.8 years compared to 18.1, $t = 2.38$, $P = 0.018$) were more likely not to be retained, as were those who missed more college or work days (monthly mean 9.14 compared to 5.99, $t = 2.04$, $P = 0.042$), were not full-time students (χ^2 12.5, 2 df, $P = 0.002$) and who had ever used crack cocaine (χ^2 4.45, 1 df, $p = 0.035$).

When controlling for ethnicity because of observed imbalance, randomization was deemed to have failed in

Table 1 Characteristics of participants at study entry.

	Intervention (n = 97)	*Control (n = 82)*	
Age (years)			
16	22%	17%	
17	32%	33%	
18	27%	24%	
19	12%	20%	
20	7%	6%	
Gender (%female)	46%	45%	
Ethnic group			
White	32%	46%	
Black	61%	37%	
Asian/other	8%	20%	$\chi^2 = 11.3$, 2 df, $P = 0.003$
Religious background			
Christian	53%	40%	
Other religion	15%	20%	
None	32%	40%	
5+ GCSE grades A–C	40%	45%	
Housing (% rented)	57%	51%	
Single-parent home	51%	49%	
Personal income (% job)	46%	45%	
Household income (% in receipt of state benefit)	40%	43%	
Tobacco	22%	23%	
Current non-smokers	27%	16%	
Non-daily smokers	52%	61%	
Daily smokers			
Alcohol			
Current non-drinkers	11%	21%	
Non-weekly drinkers	45%	32%	
Weekly drinkers	43%	48%	
Cannabis			
Current non-smokers	2%	2%	
Monthly or less smokers	13%	22%	
Weekly smokers	35%	28%	
Daily/near daily smokers	49%	48%	
Stimulant drugs			
Never used	59%	51%	
Current non-users	14%	8%	
Irregular users	19%	18%	
Monthly or more users	8%	23%	$\chi^2 = 9.0$, 3 df, $P = 0.03$
Other illicit drugs			
Current non-users	84%	79%	
Current users	16%	21%	

All differences non-significant with exception of those indicated.

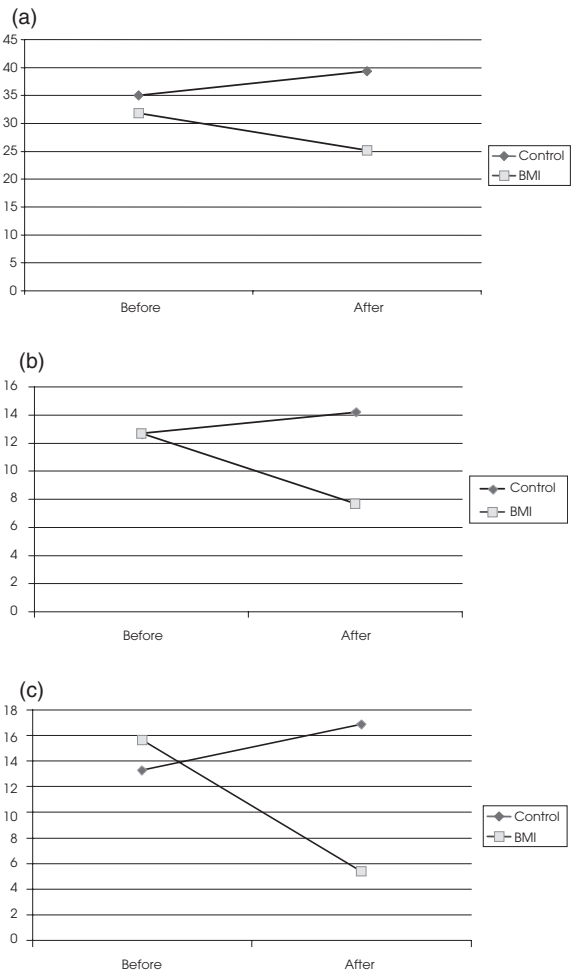

Figure 1 (a) Usual number of cigarettes smoked per week; (b) units of alcohol consumed in a recent week; (c) usual weekly frequency of cannabis use

respect of four other variables (which were also non-equivalent without controlling for ethnic group). In two of these (dependence on an illegal drug and interactional problems with parents or family), the intervention group was found to be at higher risk. In the other two (attitudinal positivity to drug use and previous decisions to cut down or stop), the reverse was true. Also, a question asking about future intentions resulted in higher levels of non-response in the intervention group which was interpreted subsequently as reflecting a genuine difference (see Results 2). No other baseline differences were observed between the groups. Two variables collected postintervention were considered additionally as potential confounders in that they were interpreted as differences between the intervention group and the control group which may possibly have existed at baseline. Preferences for stimulant drug-related musical styles and sports participated in during the study period were also thus included in initial regression models.

Results 2: changes in drug use

For the purpose of analysis of the consumption data, we considered changes in use of the selected 'target' drugs (cigarettes, alcohol and cannabis) at three levels—first, whether there were differences between the two groups as a whole; secondly, in terms of abstinence or prevalence (e.g. differences between the two groups in 'quit rates' for each of the drugs); and thirdly, whether there was evidence of moderation of the extent of use among those continuing to use (e.g. reduction in the number of units of alcohol per week). The first-level analyses of the sample interviewed after three months (179/200 = 89.5%) includes both those who had never used the named drug and also those who had subsequently given up. This level was selected to test for interactions.

Change in cigarette smoking

The control group increased its mean frequency of cigarette smoking over the three-month study period by just over 12%, from 35.0 to 39.4 cigarettes per week. The intervention group decreased by 21% on this measure, from 31.9 to 25.2 cigarettes per week—a significant difference postintervention between the control group and the intervention group in the mean number of cigarettes smoked per week [B = 13.37 (95% CI 3.55–23.19), $P = 0.009$; Fig. 1].

Of the 40 who were not current cigarette smokers at study entry, an equal number ($n = 4$) from each group commenced cigarette smoking during the subsequent 3 months. Of the 139 cigarette smokers at baseline, 19 of the 76 (25%) in the intervention group quit, compared to five of the 63 (8%) in the control group ($\chi^2 = 7.02$, df = 1, $P = 0.008$). Eighteen of these 19 intervention group quitters were black, and after adjustment for ethnicity and other potential confounders, this result fell short of statistical significance [OR = 0.36 (0.13–1.03), $P = 0.056$].

There was little difference in the mean frequency of cigarette smoking when considering change among continuing smokers only (i.e. those who were smoking both at entry to the study and follow-up). Among the 115 ongoing smokers (i.e. at both time points), the intervention group decreased from 47.7 to 41.7 cigarettes per week while the control group increased from 44.9 to 51.0 cigarettes per week. The adjusted difference in mean weekly frequency between the two groups among ongoing smokers was 11.25 (1.19–21.32, $P = 0.03$).

Change in alcohol consumption

The two groups were well-matched for pre-intervention number of units of alcohol the week before study entry (means of 12.7 units for both groups; a half pint of 3.5% beer being 1 unit in Britain). At 3-month follow-up,

among the control group the mean number of alcohol units per week had increased by 12% from 12.7 to 14.2 units in the week before follow-up interview, while in the intervention group there was a decrease of 39% from 12.7 to a mean of 7.7 alcohol units in the previous week (Fig. 1). When controlling for potential confounders, the adjusted differences in the means falls to just below 6 units [B = 5.71 (2.25–9.17), $P = 0.002$].

There were 28 non-drinkers at baseline, 11 in the intervention group and 17 in the control group. Of these, one in the intervention group and 12 in the control group initiated drinking during the 3-month follow-up period ($\chi^2 = 10.15$, df = 1, $P = 0.001$). Among the 151 current drinkers at baseline, seven of the 86 (8%) in the intervention group, and one of the 65 (1%) in the control group discontinued their drinking ($\chi^2 = 3.21$, df = 1, $P = 0.073$). When these changes are modelled together to assess the prevalence of current drinking, the intervention group are found to be significantly more likely not to be drinking alcohol at follow-up [OR = 0.07 (0.007–0.72), $P = 0.025$].

These data were also examined with the analysis restricted to the 143 ongoing drinkers. With this restriction, a similar difference in changed alcohol consumption patterns between the two groups is again evident. The ongoing drinkers among the intervention group reduced their levels of consumption from 14.7 to 9.3 units per week, while the ongoing drinkers among the control group increased from 16.0 to 17.6 units per week. Overall, at follow-up the intervention group were drinking 6.89 units (2.84–10.94, $P = 0.002$) less alcohol in the week prior to follow-up interview than the control group.

Change in cannabis use

The mean frequency of cannabis use declined by 66% in the intervention group from 15.7 times per week to 5.4. By contrast, there was an increase of 27% in the control group, from 13.3 to 16.9 (Fig. 1). After adjustment for potentially confounding variables, the difference in the two group means remained similar [B = 11.54 (6.91–16.18), $P < 0.0001$].

Virtually all the participants (98% in both the intervention group and control group) were current cannabis smokers at baseline, and the remaining four (two in each group) all initiated cannabis use in the following three months. By the time of the 3-month follow-up, 16 of the 97 (16%) in the intervention group had discontinued their cannabis use compared to four of 82 (5%) in the control group ($\chi^2 = 6.04$, df = 1, $P = 0.014$). However, when potential confounders were investigated, it was found that intention to stop at baseline (which was not equivalently distributed between groups) proved to be a strong predictor [OR = 4.69 (2.08–10.6), $P < 0.0001$], and hence this difference cannot be attributed robustly to the intervention.

As with the previous drugs, when analyses are undertaken for a restricted sample of only those who were ongoing cannabis smokers, the differences were found to be similar to those reported above for the entire sample [B = 12.78 (7.35–18.2), $P < 0.0001$]. The mean weekly frequency of cannabis use in the intervention group reduced from 18.0 to 6.6, while the control group increased from 13.9 to 18.2 on this measure.

Two other consumption variables were collected postintervention for cannabis use only—usual quantity consumed in a given period (per day or per week) and number of days abstinent in the past month. On both outcomes the differences between the groups were significant but not as proportionately large as the frequency measure. When comparison is made on mean usual quantity of cannabis consumed per week, there was a difference between groups of almost one-eighth of an ounce [B = 0.12 (0.01–0.22), $P = 0.031$]. Also, with regard to days without any use, the intervention group smoked cannabis on average 4 days a month less than the control group [B = 4.13 (1.17–7.09), $P = 0.008$].

Change in other drug use

During the 3-month study period, 13 participants (14% of the 96 who had not reported doing so previously) initiated the use of illicit drugs other than cannabis for the first time. These represented 6% ($n = 6$) of the intervention group and 9% ($n = 7$) to the control group. The most common drug initiated among this group was ecstasy ($n = 6$).

The numbers in both study groups reporting the use of any stimulant drugs in the three month periods before and after intervention remained stable. In the intervention group, this number reduced slightly from 26 to 24 (27% to 25%), while in the control group there was no change ($n = 34$, 41%). There were also small changes in the numbers reporting use of individual drugs (ecstasy, cocaine and amphetamines) but no significant differences were observed between the intervention group and the control group in relation to whether or not any stimulant drugs were used.

Drug use patterns were less stable in relation to other non-stimulant illicit drugs (predominantly LSD, magic mushrooms and amyl nitrites). In the control group, the number reporting use of these drugs increased from 17 to 27 (21–33%), whereas in the intervention group other drug use reduced from 15 to 11 (15–11%) in the 3 months before and after intervention.

Involvement in the use of non-stimulant other drugs was modelled in the same way as the cigarette smoking, alcohol consumption and cannabis use outcomes. When

controlling for baseline and other relevant variables, this difference was statistically significant, with the intervention group remaining approximately one-third less likely to have used such drugs during the study period. This finding was observed both when restricted to only those having used illicit drugs other than cannabis at study entry ($n = 83$, OR = 0.29, $P = 0.014$) or among the full sample of 179 participants who were followed-up successfully (OR = 0.32, $P = 0.042$).

No differences between the intervention group and the control group in mean frequencies of use of individual drugs were robustly attributable to the intervention. The numbers available for these analyses were small, with the most prevalent drug (ecstasy) being used by 25% of the sample ($n = 44$) during the study period. This finding was observed whether one considers frequency of use among current users at study entry, those reporting use during the 3-month study period, those with prior experience of any illicit drugs other than cannabis or among the entire available sample.

Table 2 Change in drug-specific perceptions.

	Regression coefficient	P-*value*
Cigarette smoking		
Decisions to cut down or stop	OR = 2.10	0.067
Dependence	B = 1.34	0.006
Importance	B = 0.63	0.055
Problem identification	B = 0.46	0.032
Alcohol consumption		
Decisions to cut down or stop	OR = 6.40	$P < 0.001$
Importance	B = 0.51	0.002
Cannabis use		
Decisions to cut down or stop	OR = 3.53	0.008
Importance	B = 0.35	0.055
Future intentions	OR = 0.27	0.016
Other drug use		
Interactional problems (any)	OR = 3.70	0.030
Interactional problems (mean)	B = 3.80	0.013
Future intentions	B = 0.48	0.019

Results 3: changes in perceptions of drug-related risk and harm

Change in drug-specific perceptions

Drug-specific perceptions investigated for each of the drug categories (cigarette smoking, alcohol consumption, cannabis use, other drug use) were: decision to cut down or stop use during the study period; dependence (SDS); interactional problems; importance; problem identification; and future intentions. In the interests of economy of presentation, only those outcomes in which differences between the intervention group and the control group were observed are reported here.

The intervention group were approximately twice as likely to have made a decision to stop or cut down cigarette smoking as the control group [intervention group 33% ($n = 32$), control 18% ($n = 15$)], although this difference between the groups was not statistically significant (OR = 2.1, $P = 0.067$). Among those smoking cigarettes at follow-up ($n = 123$), the mean SDS score for the intervention group was 5.1, compared to 6.4 for the control group. The difference in adjusted mean scores in excess of one point is statistically significant (B = 1.34, $P = 0.006$).

Those smoking at follow-up ($n = 123$) were asked to rate how important their cigarette use was to them on a seven-point scale. On this measure, the control group mean score was 3.5 and the intervention group 2.8. The adjusted mean difference between the groups, of just under two-thirds of a point, falls short of statistical significance (B = 0.63, $P = 0.055$). Participants were also asked to rate how problematic was their use of each drug, on a five-point scale. The mean scores for cigarette smoking were 2.35 for the intervention group and 2.98 for the control group. This resulted in an adjusted mean difference of almost half a point among ongoing smokers ($n = 123$, B = 0.46, $P = 0.032$). Changes in drug specific perceptions are summarized in Table 2.

Twenty-three per cent ($n = 22$) of the intervention group reported having made a decision to cut down or stop drinking, compared to 6% of the control group ($n = 5$). Those receiving the intervention were approximately six-and-a-half times more likely to have made a decision to cut down or stop in the 3 months after the intervention (OR = 6.4, $P < 0.0001$), after controlling for baseline and potentially confounding variables. A difference between the two groups was also observed in relation to the subjective importance of alcohol. On the seven-point scale, the intervention group reported a mean of 2.7 and the control group 3.1 among those drinking at follow-up. When modelled, alcohol was reported to be less important to the intervention group than the control group by approximately half a point at follow-up (B = 0.51, $P = 0.002$).

High levels of decisions to stop or cut down on the use of cannabis were reported in both groups [75% ($n = 73$) of the intervention group and 44% ($n = 36$) of the control group] during the 3-month study period. Those receiving the intervention were approximately three-and-a-half times as likely to have made such a decision (OR = 3.53, $P = 0.008$) after adjusting for baseline and other potential confounders. Among ongoing cannabis users, mean importance scores for the intervention group and the control group were 3.6 and 4.1, respectively (on a seven-point scale). This finding did not reach statistical significance (B = 0.35, $P = 0.055$).

The intervention group and the control group differed significantly at follow-up in relation to their future cannabis use intentions. At the 3-month follow-up point, 45% ($n = 44$) of the intervention group intended not to be using cannabis 12 months later, compared to 15% ($n = 12$) of the control group. Adjusting for relevant variables including baseline non-equivalence on this measure, the control group were almost four times as likely to state an intention to use cannabis beyond 12 months (OR = 0.27, $P = 0.016$).

To investigate future intentions in relation to other drug use, the number of different drugs that participants intended to be using 12 months after data collection was measured at both assessment points. It was found that despite the randomization procedure, there was already a significant difference between the groups as a whole ($n = 179$) on this variable prior to intervention (intervention group mean number 1.51, control group 2.26) when assessment was by self-completion questionnaire. The number increased for both groups and the gap between the two widened further (intervention group 2.26, control group 3.01) at the researcher-administered follow-up interview, in which there was prompting of legal drugs. A significant difference between the groups was observed after adjustment for baseline non-equivalence and other potential confounders (B = 0.48, $P = 0.019$).

The intervention group and the control group differed in relation to interactional problems attributed to the use of stimulant and other drugs (which were measured together). Among the 42 intervention group participants who were baseline illicit drug users (other than cannabis), five (12%) reported having any such interactional problems in the 3 months after intervention, compared to 15 of the 41 in the control group (37%; χ^2 6.9, 1 df, $P = 0.009$). When the total number of these problems are compared in the two groups, the mean scores are 0.12 and 0.49, respectively ($t = 2.8$, $P = 0.006$). These two findings are found to be robust after controlling for potential confounders (any problems OR = 3.7, $P = 0.03$; number of problems B = 0.38, $P = 0.013$).

Higher levels of motivational stage of change in relation to drug use in general were observed in the intervention group where there was self-nomination of stage of change. Converting these stages to scores and modelling as a continuum, on average three of every four participants in the intervention group reported being one stage higher than their control group counterparts at follow-up, after controlling for baseline status (B = 0.76, $P = 0.004$) and other potential confounders.

Change in behavioural outcomes

Self-monitoring was encouraged as a component of intervention. Two behavioural outcome measures were used; the recording of consumption and the recording of consequences. During the 3-month study period, 13 of the intervention group recorded consumption of at least one drug, compared to only one individual in the control group. The intervention group was found to be more than 20 times as likely to have done so, after adjusting for other variables (OR = 22.6, $P = 0.003$). There were no differences between groups in the recording of consequences, with all seven individuals who recorded consequences in the study period, having done so previously.

Prior life-time and study period prevalences were collected on whether participants had been offered heroin or were present during heroin smoking. During the study period, 12% of the intervention group and 18% of the control group had been offered heroin, but this difference was not significant (B = 0.43, $P = 0.096$). Fourteen per cent ($n = 14$) of the intervention group and 26% ($n = 21$) of the control group had been present at heroin smoking in the study period, resulting in a significant difference between the two groups. The control group was approximately twice as likely as the intervention group to be exposed to the risk involved in being present at heroin smoking (OR = 0.41, $P = 0.005$).

Forty per cent of control group participants sold drugs to friends in the 3-month study period, compared to 15% of the intervention group. The control group were found to be twice as likely to have sold drugs to friends, after controlling for relevant variables (OR = 0.42, $P = 0.008$). Fourteen per cent of control group participants sold drugs to people who were not friends in the same period, compared to 7% of the intervention group. The odds ratio is similar to the previous comparison, but the reduced proportions in both groups entail that this difference is not significant (OR = 0.45, $P > 0.1$). The control group also increased the number of evenings nightclubbing from a mean number of 2.5–3.3 per month, while the intervention group decreased from a mean of 2.8–2.4 per month. This difference between the two groups was statistically significant (B = 1.32, $P = 0.009$) (Table 3).

The proportions in each group reporting any problems in a set of interactional categories (college staff, peers, police, parents or family, local adults, partners,

Table 3 Behavioural outcomes.

	Regression coefficient	P-*value*
Offered heroin	B = 0.43	0.096
Present at heroin smoking	OR = 0.41	0.005
Selling drugs to friends	OR = 0.42	0.008
Nights clubbing	B = 1.32	0.009
Self-monitoring	OR = 22.6	0.003
Parent/family problems	B = 0.25	0.039
No. of interactional problems	B = 0.57	0.045

others) was investigated. These are problems whose cause was attributed by participants themselves to their own drug use. In only one category (parents or family, with which there were most problems reported both pre and postintervention) was the difference between the two statistically significant (B = 0.25, $P = 0.039$). The postintervention measure enquired as to drug types (cigarettes, alcohol, cannabis, other drugs), and for each of these drug types for which there was an interactional problem, this was counted as a separate problem. The control group reported on average 1.66 problems each compared to 1.19 in the intervention group. When the groups were compared, the difference in the number of interactional problems reported was statistically significant (B = 0.57, $P = 0.045$).

Results 4: further analyses of the nature of the effects

In the earlier section (Results 2) no adjustment has been made for missing data, in light of interventions having been delivered to all randomized to receive MI and the analyses of attrition undertaken (Results 1). As a further test of whether attrition may in some way have influenced these findings, an 'intention-to-treat' analysis was also undertaken, with drug use assumed to be unchanged among those who were lost to follow-up. The estimates of intervention effect are found to be very similar to those reported in Results 2: cigarette smoking B = 12.96 (3.42–22.49), $P = 0.009$; alcohol consumption B = 4.95 (1.96–7.94), $P = 0.002$; cannabis use B = 11.51 (7.53–15.49), $P < 0.0001$.

Effect modification was evaluated to explore whether there were variations in the effect on reduced use for each of the three main drugs. Interaction terms for condition by baseline characteristics were added to the models ($n = 179$). These analyses permitted consideration of the extent to which the effects of intervention were subject to mediation by intervening variables, such as age, ethnic group and other psychosocial and drug use characteristics.

For cigarette smoking, only one statistically significant relationship was found: those who were currently using LSD, magic mushrooms, amyl nitrite or other non-stimulant drugs at study entry did not reduce their cigarette smoking as much as those who were not [B = 19.1 (2.45–35.75), $P = 0.026$].

For the reduced alcohol consumption effect, a number of interactions with baseline measures were identified. After controlling for consumption at study entry, those who were drinking more reduced their drinking by more [B = 0.34 (0.06–0.63), $P = 0.02$]. So, too, did heavier cigarette smokers [B = 0.1 (0.02–0.19), $P = 0.019$] and those who rated highly the pleasure they gained from drug use on a 10-point scale [B = 1.79 (0.13–3.45), $P = 0.036$]. Income source was also relevant: those who gained most of their income from work reduced their consumption by more than those who relied on parents for their income [B = 7.72 (1.1–14.38), $P = 0.024$]. Considering also main income from other sources (a residual category with 30 cases), the significance of the interaction term is borderline ($F = 3.28$, df = 2, $P = 0.052$).

Table 4 Variability in reduced cannabis use effect.

Variable	*Effect larger for*	*Significance*
Cannabis use frequency	More frequent	<0.0001
Alcohol consumption	Those drinking less	0.047
Cigarette smoking level	More frequent	0.015
Gender	Men	0.01
GCSE passes grades A–C	Those with less	0.038
Household benefits reliance	Those on benefits	0.006
Drug use pleasure rating	Higher scorers	0.047
Psychosocial vulnerability	More vulnerable	0.02
Drug-dealing (not friends)	Those with prior history	0.038

For the reduced cannabis use effect, a larger number of statistically significant interactions were identified. These are summarized in Table 4. The indicator of psychosocial vulnerability was constructed a priori from lifetime experience of psychiatric or social services care, homelessness and temporary and permanent school exclusions (1 point for each, up to a total of 5). As with reduced alcohol consumption, heavier users of this drug, heavier cigarette smokers and those who rated highly the pleasure they gained from drug use reduced their consumption by more.

For illustrative purposes, the between-group differences in frequency of cigarette smoking and cannabis use and the quantity/frequency measure of alcohol were standardized (i.e. transformed to have a mean of zero and a standard deviation of 1). In this way, the intervention effect was found to be larger for cannabis [0.75 (0.45–1.0)], than for alcohol [0.37 (0.15–0.6)] or cigarette use [0.34 (0.09–0.59)].

DISCUSSION

The following observations warrant particular attention. First, young people appear to benefit from this type of brief intervention in a similar way to adults, for individual drugs of use. Secondly, moderation among ongoing users appears to be a greater source of this benefit rather than quitting altogether. Thirdly, those drug users who have been found with other approaches to be the least likely to benefit (despite being generally the most in need), actually derive more benefit. Fourthly, there is a contrast between the modesty of the shift in perceptions and inter-

actional behaviours and the more dramatic changes obtained in actual drug consumption. Lastly, these benefits have been simultaneously derived across a number of different drugs.

Before discussing these areas in more depth, consideration of the limitations of the study is necessary. The choice of a non-intervention education-as-usual control condition imposes limitations on the inferences that may be drawn. It is possible that other interventions with this target population may secure similar benefits, as no control of non-specific intervention factors was attempted. It has not been possible with this study design to completely exclude the possibility of a Hawthorn effect. Also, it must be noted that the numbers reporting use of illicit drugs other than cannabis were small and thus statistical power to detect intervention effects in relation to other drug use is limited. Data were self-reported, without biochemical validation, and future studies should seek to include measures to test the validity of self-report. Lastly, observations have been made after only 3 months following intervention. Longer-term outcome evaluation is clearly required in order to establish the transience or robustness of the intervention effects.

The extent of benefits for individual drugs, replicate previous findings in adult populations and age within the population under study has not interfered with the capacity to benefit from the intervention, with 16-year-olds reducing drug use as much as older teenagers. Odds ratios for smoking cessation interventions are similar (Wetter *et al.* 1998). Data on reduced smoking levels are not so readily available but have been the subject of recent attention (Hughes, Cummings & Hyland 1999). Intervention studies with adult cannabis users are relatively rare. In the one published report of MI with this population, the reduction in smoking observed was of a similar magnitude to that observed here (Stephens, Roffman & Curtin 2000). In another brief intervention study (with a different population and a different intervention, but of similar duration), a dramatic reduction in cannabis use among adult dependent users was also reported (Lang, Engelander & Brooke 2000). Reductions in drinking in adult populations are proportionately greater than was observed here (Miller 2000). The findings on enhanced benefit for heavier drinkers and cannabis smokers replicate what is already known for adult drinkers (Miller 2000).

The significance of the observed changes in consumption is difficult to evaluate—arguably, this becomes a meaningful issue only as and when any intervention of this type fulfils the public health aspiration of diversion to less harmful long-term drug use patterns. Perhaps the real achievement here is that some influence has been secured, albeit short-term, in an area where evidence of intervention impact is so meagre, yet policy relevance so high.

For all three drugs used by the majority of the study population, the intervention group contained greater numbers of quitters than the control group. The numbers involved are small but are suggestive that larger, more highly powered studies may detect consistent benefits of this type. However, the observed reductions across the groups only partly derive from quitting and are attributable mainly to moderation among ongoing users, i.e. reducing quantity and/or frequency of continued use. It will be important for future studies to explore the durability over time of the different avenues to benefit, i.e. the extent to which quitting (on one hand) and moderation of continued use (on the other hand) lead to robust maintenance of change at longer-term follow-up.

A particularly encouraging supplementary finding was that those most in need or at most risk were generally those who were most likely to show healthy beneficial changes in their drug use behaviours. In the case of cannabis, the interactions identified in Table 4 have a coherence to them which is especially significant with respect to high-risk young people. The conjunction of enhanced benefits for heavier consumers, for those on state benefits, for those who are unsuccessful educationally and for those who are psychosocially vulnerable is especially noteworthy.

An interesting and unexpected phenomenon was observed; the modesty of the shift in perceptions and interactional behaviours, alongside the substantial observed changes in actual drug-taking behaviour. While there is evidence of impact on some perception measures in the three drugs in which changed consumption was most apparent (tobacco, alcohol and cannabis), this is somewhat patchy in nature and is not closely related to the observed changes in behaviour. Even where there is relatively more consistent evidence of intervention effect (on other drugs), these are the drugs where change in consumption was not observed.

This apparent paradox has many parallels in the brief interventions literature. For example, the World Health Organization (WHO) cross-national alcohol brief intervention study (WHO Brief Intervention Study Group 1996) found no effect on problems in the context of an effect upon consumption of a similar magnitude to that observed in this study. On the other hand, Chick *et al.* (1985) found no effect on actual alcohol consumption but did observe an effect on problems. Marlatt *et al.* (1998), in their study of high-risk college students, observed effects on both consumption and also on problems, with a greater impact upon problems.

Several possible explanations need to be considered. It may be that the relatively low levels of drug-specific interactional problems and dependence scores observed in this study population themselves preclude positive evidence of a distinctive intervention benefit. Or, in the case of inter-

actional problems, even where they are attributed to drug use by the young people concerned, it may be that other interactional influences are at work.

The final striking observation is the multiplicity of the beneficial reductions in drug use, i.e. that a single intervention can secure such broad-ranging benefit. Recently attention has been given to effects on drug use other than the primary treatment target (Harris *et al*. 2000). Similarly, a community intervention trial targeting cigarette smoking in young people reported effects on drinking and cannabis use (Biglan *et al*. 2000). Incorporation of brief interventions into routine service provision has been identified as a crucial strategic element to tackling the enormous long-term health costs of both cigarette smoking and excessive alcohol consumption by adults, but this logic has not yet been similarly applied to illicit drug use and to adolescents. In light of the limitations of this study, it is appropriate to be cautious. However, the tantalizing prospect resulting from this study is that a brief conversation with young people, which is comprehensive in its consideration of drug use, can simultaneously set in motion reductions in risk behaviours across different drugs of use.

ACKNOWLEDGEMENTS

The PhD study was undertaken in the context of a Research Training Fellowship awarded by the NHS Executive (London/South Thames) to the first author under the supervision of the second author. We are grateful to Sophia Rabe-Hesketh for advice on statistical methods, and to Jenny Abbey for assistance with interviewing. The comments of reviewers have also been helpful during revision of the original manuscript.

REFERENCES

Advisory Council on the Misuse of Drugs (1988) *AIDS and Drug Misuse*, Part I. London: HMSO.

Advisory Council on the Misuse of Drugs (1993) *AIDS and Drug Misuse: Update Report*. London: HMSO.

Anthony, J. C. & Petronis, K. R. (1995) Early-onset drug use and risk of later problems. *Drug and Alcohol Dependence*, **40**, 9–15.

Argyle, M. (1987) *The Psychology of Happiness.* London, Meuthen.

Bailey, S. L. & Rachal, J. V. (1993) Dimensions of adolescent problem drinking. *Journal of Studies on Alcohol*, **54**, 555–565.

Bien, T. H., Miller, W. R. & Tonigan, S. J. (1993) Brief interventions for alcohol problems: a review. *Addiction*, **88**, 315–336.

Biglan, A., Ary, D. V., Smolkowski, K., Duncan, T. & Black, C. (2000) A randomized controlled trial of a community intervention to prevent adolescent tobacco use. *Tobacco Control*, **9**, 24–32.

Boreham, R. & Shaw, A. (2001) *Smoking, Drinking and Drug Use Among Young People in England in 2000.* London: Office of National Statistics.

Botvin, G. J., Baker, E., Dusenbury, L., Botvin, E. M. & Diaz, T. (1995) Long term follow-up results of a randomized drug abuse prevention trial in a white middle-class population. *Journal of the American Medical Association*, **273**, 1106–1112.

Carey, K. B., Purnine, D. M., Maisto, S. A. & Carey, M. P. (1999) Assessing readiness to change substance abuse: a critical review of instruments. *Clinical Psychology: Science and Practice*, **6**, 245–266.

Chick, J., Lloyd, G. & Crombie, E. (1985) Counselling problem drinkers in medical wards: a controlled study. *British Medical Journal*, **290**, 965–967.

Colby, S. M., Monti, P. M., Barnett, N. P., Rohsenow, D. J., Weissman, K., Spirito, A., Woolard, R. & Lewander, W. (1998) Brief motivational interviewing in a hospital setting for adolescent smoking. *Journal of Consulting and Clinical Psychology*, **66**, 574–578.

Darke, S. (1998) Self-report among injecting drug users: a review. *Drug and Alcohol Dependence*, **51**, 253–263.

Fergusson, D. M. & Horwood, J. (2000) Does cannabis use encourage other forms of illicit drug use? *Addiction*, **95**, 505–520.

Foxcroft, D. R., Lister-Sharp, D. & Lowe, G. (1997) Alcohol misuse prevention for young people: a systematic review reveals methodological concerns and lack of reliable evidence of effectiveness. *Addiction*, **92**, 531–537.

Goldberg, D. & Williams, P. (1988) *A User's Guide to the General Health Questionnaire*. Windsor: NFER-Nelson.

Gossop, M., Darke, S., Griffiths, P., Hando, J., Powis, B., Hall, W. & Strang, J. (1995) The Severity of Dependence Scale (SDS): psychometric properties of the SDS in English and Australian samples of heroin, cocaine and amphetamine users. *Addiction*, **90**, 607–614.

Griffiths, P., Gossop, M., Powis, B. & Strang, J. (1993) Reaching hidden populations of drug users by privileged access interviewers (PAI): methodological and practical issues. *Addiction*, **88**, 1617–1626.

Harris, J., Best, D., Man, L. H., Welch, S., Gossop, M. & Strang, J. (2000) Changes in cigarette smoking among alcohol and drug misusers during inpatient detoxification. *Addiction Biology*, **5**, 443–450.

Harrison, L. (1995) The validity of self-reported data on drug use. *Journal of Drug Issues*, **25**, 91–111.

Heather, N. (1995a) Groundwork for a research programme on harm reduction in alcohol and drug treatment. *Drug and Alcohol Review*, **14**, 331–336.

Heather, N. (1995b) Brief intervention strategies. In: Hester, R. K. & Miller, W. R., eds. *Handbook of Alcoholism Treatment Approaches: Effective Alternatives.* 2nd edn, pp. 105–122. London: Allyn and Bacon.

Hughes, J. R., Cummings, K. M. & Hyland, A. (1999) Ability of smokers to reduce their smoking and its association with future smoking cessation. *Addiction*, **94**, 109–114.

Hunt, N., Grifiths, P., Southwell, M., Stillwell, G. & Strang, J. (1999) Preventing and curtailing injecting drug use: a review of opportunities for developing and delivering 'route transition interventions'. *Drug and Alcohol Review*, **18**, 441–451.

Institute of Medicine (1996) *Pathways of Addiction.* Washington, DC: National Academy Press.

Kandel, D. B., Davies, M., Kraus, D. & Yamaguchi, K. (1986) The consequences in young adulthood of adolescent drug involvement: an overview. *Archives of General Psychiatry*, **43**, 746–754.

Lang, E., Engelander, M. & Brooke, T. (2000) Report of an integrated brief intervention with self-defined problem can-

nabis users. *Journal of Substance Abuse Treatment*, **19**, 111–116.

Lawendowski, L. A. (1998) A motivational intervention for adolescent smokers. *Preventive Medicine*, **27**, A39–A46.

Lenton, S. & Single, E. (1998) The definition of harm reduction. *Drug and Alcohol Review*, **17**, 213–220.

Marlatt, G. A., Baer, J. S., Kivlahan, D. R., Dimeff, L. A., Larimer, M. E., Quigley, L. A., Somers, J. M. & Williams, E. (1998) Screening and brief intervention for high-risk college student drinkers: results from a 2-year assessment. *Journal of Consulting & Clinical Psychology*, **66**, 604–615.

McCambridge, J. & Strang, J. (2003) Development of a structured generic drug intervention model: a brief application of motivational interviewing with young people. *Drug and Alcohol Review*, **22**, 391–399.

McConnaughy, E. A., DiClemente, C. C., Prochaska, J. O. & Velicer, W. F. (1989) Stages of change in psychotherapy: a follow-up report. *Psychotherapy: Theory, Research and Practice*, **26**, 494–503.

Measham, F., Aldridge, J. & Parker, H. (2001) *Dancing on Drugs: Risk, Health and Hedonism in the British Club Scene.* London: Free Association.

Miller, W. R. (2000) Rediscovering fire: small interventions, large effects. *Psychology of Addictive Behaviors*, **14**, 6–18.

Miller, W. R. & Rollnick, S. (1991) *Motivational Interviewing: Preparing People to Change Addictive Behavior*. New York: Guilford Press.

Miller, W. R. & Rollnick, S. (2002) *Motivational Interviewing: Preparing People for Change*, 2nd edn. New York: Guilford Press.

Miller, W. R., Sovereign, R. G. & Krege, B. (1988) Motivational interviewing with problem drinkers. II. The Drinker's Checkup as a preventive intervention. *Behavioural Psychotherapy*, **16**, 251–268.

Monti, P. M., Colby, S. M., Barnett, N. P., Spirito, A., Rohsenow, D. J., Myers, M., Woolard, R. & Lewander, W. (1999) Brief intervention for harm reduction with alcohol-positive older adolescents in a hospital emergency department. *Journal of Consulting and Clinical Psychology*, **67**, 989–994.

Newcombe R. (1992) The reduction of drug-related harm: a conceptual framework for theory, practice and research. In: O'Hare, P. A., Newcombe, R., Matthews, A., Buning, E. C. & Drucker, E., eds. *The Reduction of Drug Related Harm*, pp. 1–14. London: Routledge.

Oetting, E. R. & Beauvais, F. (1990) Adolescent drug use: findings of national and local surveys. *Journal of Consulting and Clinical Psychology*, **58**, 385–394.

Office for National Statistics (ONS) (2001) *Social Trends 31*. London: The Stationery Office.

Parker, H., Measham, F. & Aldridge, J. (1998) *Illegal Leisure*. London: Routledge.

Pocock, S. J. (1997) Clinical trials with multiple outcomes: a statistical perspective on their design, analysis and interpretation. *Controlled Clinical Trials*, **18**, 530–545.

Ramsey, M., Baker, P., Goulden, C., Sharp, C. & Sondhi, A. (2001) *Drug Misuse Declared in 2000: Results from the British Crime Survey.* Home Office Research Study 224. London: Home Office.

Ramsey, M. & Partridge, S. (1999) *Drug Misuse Declared in 1998: Results from the British Crime Survey*. Home Office Research Study no. 197. London: Home Office.

Rollnick, S., Heather, N. & Bell, A. (1992a) Negotiating behaviour change in medical settings: the development of brief motivational interviewing. *Journal of Mental Health*, **1**, 25–37.

Rollnick, S., Heather, N., Gold, R. & Hall, W. (1992b) Development of a short 'readiness to change' questionnaire for use in brief opportunistic interventions among excessive drinkers. *British Journal of Addiction*, **87**, 743–754.

Russell, M. A., Wilson, C., Taylor, C. & Baker, C. D. (1979) Effect of general practitioners' advice against smoking. *British Medical Journal*, **6184**, 231–235.

StataCorp (1998) *Stata Statistical Software Release 6 0*. College Station, TX: Stata Corporation.

Stephens, R. S., Roffman, R. A. & Curtin, L. (2000) Comparison of extended versus brief treatments for marijuana use. *Journal of Consulting and Clinical Psychology*, **68**, 898–908.

Stimson, G. V. (1995) AIDS and injecting drug use in the United Kingdom, 1987–93: the policy response and the prevention of the epidemic. *Social Science and Medicine*, **41**, 699–716.

Strang, J. (1992) Harm reduction for drug users: exploring the dimensions of harm, their measurement, and strategies for reduction. *AIDS and Public Policy Journal*, **7**, 145–152.

Strang J. (1993) Drug use and harm reduction: responding to the challenge. In: Heather, N., Wodak, A., Nadelmann, E. & O'Hare, P., eds. *Psychoactive Drugs and Harm Reduction: from Faith to Science*, pp. 3–20. London: Whurr.

Strang, J. (1994) Opiates: are there under-utilized and unexplored areas of prevention? *Addiction*, **89**, 1511–1516.

Strang, J. (1998) AIDS and Drug misuse in the UK—10 years on: achievements, failings and new harm reduction opportunities. *Drugs, Education, Prevention and Policy*, **5**, 293–304.

Sutherland, I. & Willner, P. (1998) Patterns of alcohol, cigarette and illicit drug use in English adolescents. *Addiction*, **93**, 1199–1208.

Swift, W., Copeland, J. & Hall, W. (1998) Choosing a diagnostic cut-off point for cannabis dependence. *Addiction*, **93**, 1681–1692.

Tober G. (1991) Motivational interviewing with young people. In: Miller, W. R. & Rollnick, S., eds. *Motivational Interviewing: Preparing People to Change Addictive Behavior*, pp. 248–259. New York: Guilford Press.

Tobler N (1997) Meta-analysis of adolescent drug prevention programs: results of the 1993 meta-analysis. In: Bukoski, W. J., ed. *Meta-Analysis of Drug Abuse prevention Programs.* NIDA Research Monograph 170. Rockville, MD: National Institute of Health.

Updated Drug Strategy (2002) London: Home Office.

Walker, A., Maher, J., Coulthard, M., Goddard, E. & Thomas, M. (2001) *Living in Britain: Results from the 2000/01 General Household Survey*. London: The Stationery Office.

Wetter, D. W., Fiore, M. C., Gritz, E. R., Lando, H. A., Stitzer, M. L., Hasselblad, V. & Baker, T. B. (1998) The Agency for Health Care Policy and Research Smoking Cessation Clinical Practice Guideline: findings and implications for psychologists. *American Psychologist*, **53**, 657–669.

White, D. & Pitts, M. (1998) Educating young people about drugs: a systematic review. *Addiction*, **93**, 1475–1487.

WHO Brief Intervention Study Group (1996) A cross-national trial of brief interventions with heavy drinkers. *American Journal of Public Health*, **86**, 948–955.